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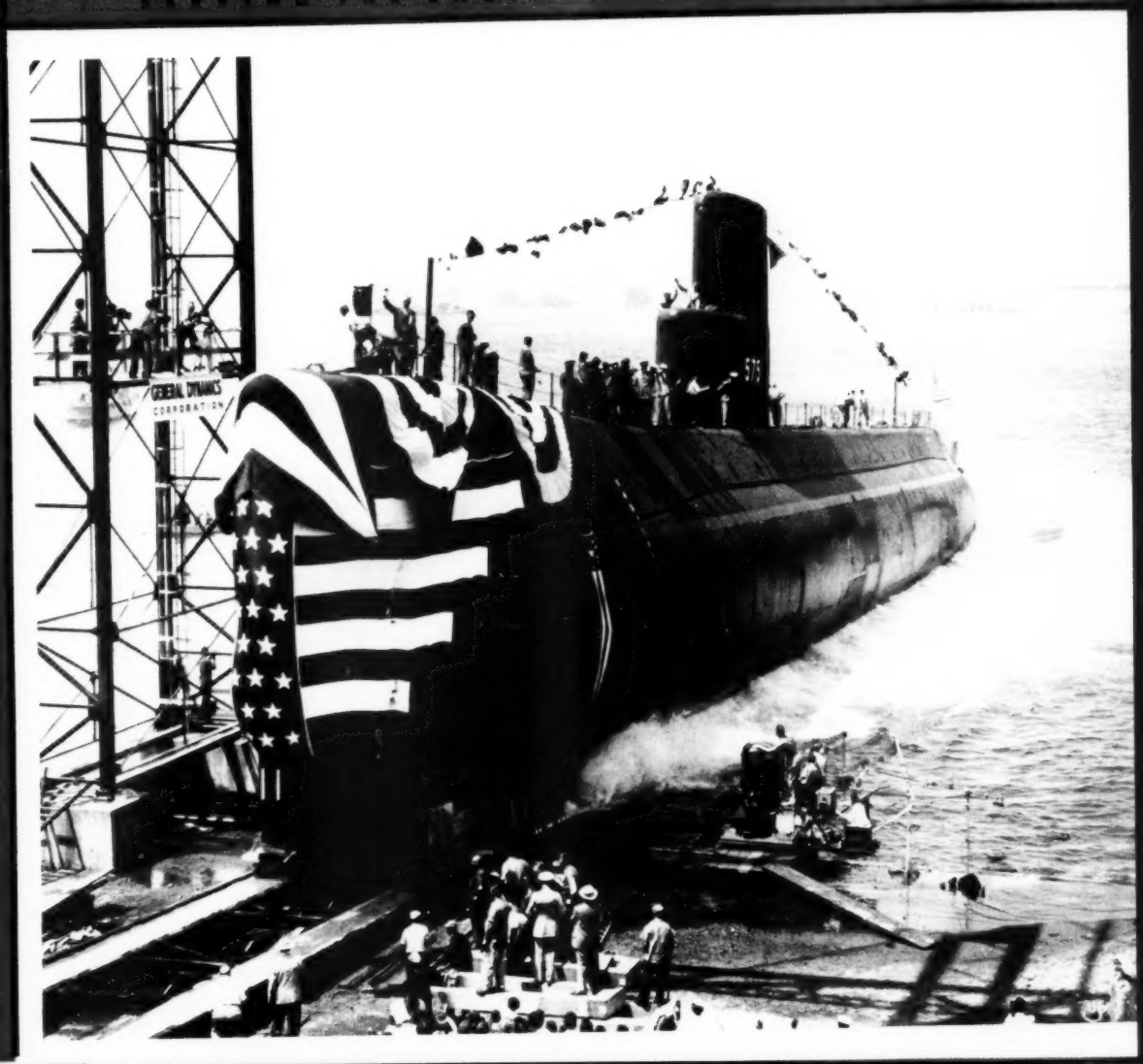

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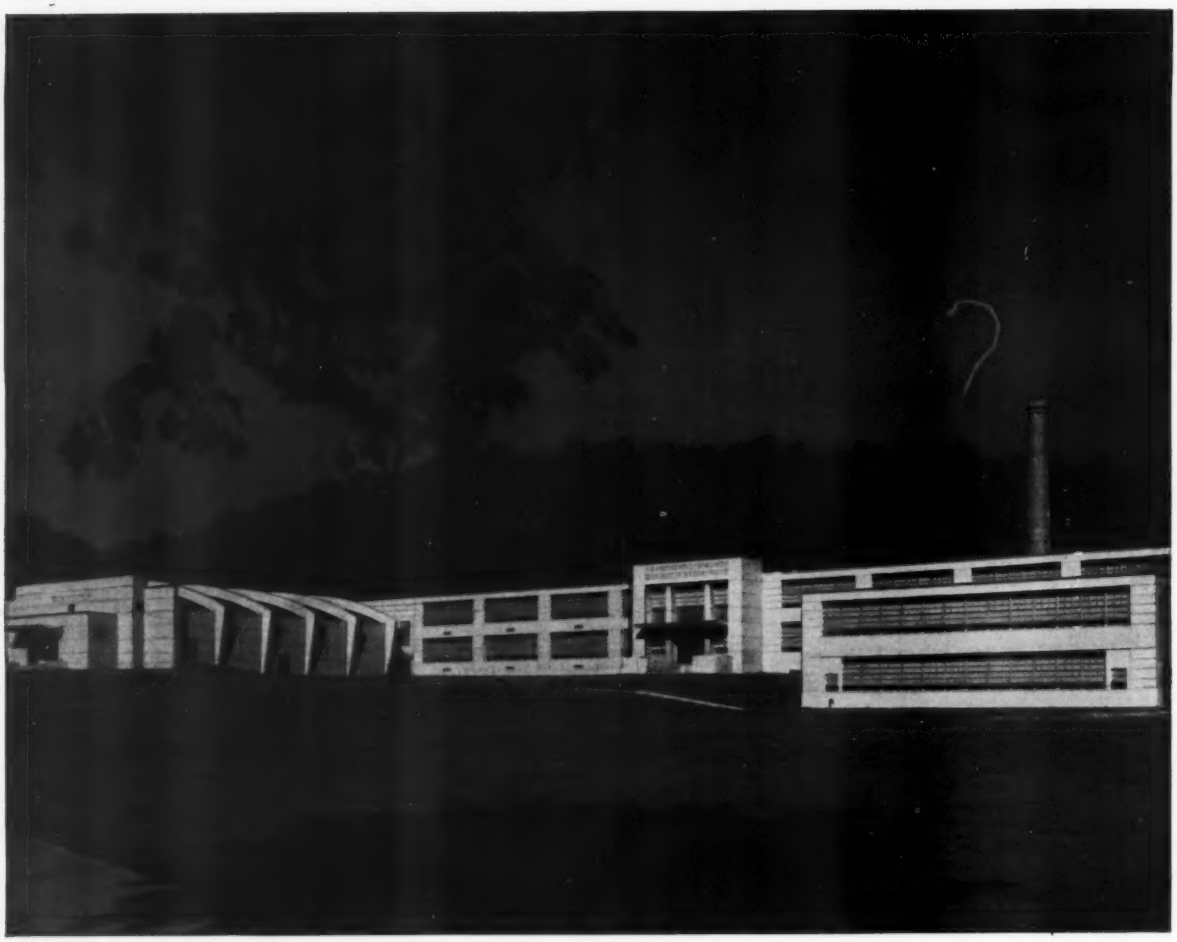
TRUCK TIRE FIRE TESTS — PAGE THREE

Vol. 8 NOVEMBER, 1955 No. 6



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Serving the Engineering Profession

NOVEMBER, 1955 Vol. 8, No. 6

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COVER STORY

MAIDEN DIP—The atomic-powered submarine "Seawolf" checks its high-speed launching run in the waters of the Thames River at Groton, Connecticut. Seawolf was christened July 21, 1955 at the Electric Boat Division of General Dynamics Corporation by Mrs. W. Sterling Cole, wife of Congressman Cole of New York. See page 7 for more on this interesting vessel.

The meeting of Nov. 22

Free Cocktail Hour
5:15 to 6:15 p.m.

Dinner
6:30 to 7:30 p.m.

Coffee Talk
7:30 to 7:45 p.m.

"Amusing Incidents in a Colorful Life"

By John J. Schommer, all-time, all-American athlete, and an after dinner speaker par excellence.

John Schommer, dean of collegiate athletic officials has so many firsts to his credit that one hardly knows where to begin. During his Big Ten athletic career John won 12 letters in baseball, football, basketball and track—and is one of a handful of Big Ten athletes who have won letters in 4 major sports in a year. In basketball he was conference high scorer three consecutive years, all-Western and all-American center and in 1949 was selected all-time all-American basketball center by the Helms Foundation. He has held track records in the high jump and broad jump. He led the Big Ten in batting and number of home runs. His prowess attracted several offers from professional baseball teams, all of which he turned down to continue his studies. He later became a legendary figure at IIT, where he served as athletic director, professor and currently as development officer. His civic interests, too numerous to mention, are known to all.

Session 1.

8:00 p.m.

"Metropolitan Chicago Flood Control"

"What are the flood control responsibilities of the State of Illinois"—Functions and responsibilities of the Division of Waterways of the State of Illinois

By R. R. Williams, district engineer, Division of Waterways, State of Illinois.

Recent floods, particularly those of October, 1954, have emphasized the fact that flood conditions in the Metropolitan Chicago area and elsewhere in Illinois are of major import and that proper solution to the flood control problems is essential to the economy and welfare of all citizens.

Mr. Williams will discuss the functions and responsibilities of the Division of Waterways and describe the procedure followed in making engineering and economic studies of the flood problems in any given locality.

Session 2.

8:00 p.m.

"Hydro-Forming—Low Cost Deep Drawing"

By Colonel Herman E. Lacy, Helmco, Inc.

Colonel Lacy, president of Helmco, Inc., manufacturers of electric food handling, merchandising displays and dispensers will discuss hydro-forming—the low cost method of producing deep drawn parts in short and medium run quantities. Hydro-forming is one of the latest developments in the metal working industry for making small and medium quantity runs of deep drawn metal stampings economically practical.

Session 3.

8:00 p.m.

"You Can't Hardly Walk no More"

The latest in passenger conveyors

By R. G. Zilly and Robert Schaeffer, Stevens-Adamson Manufacturing Company.

Messers. Zilly and Schaeffer will discuss the design and operation of moving belt passenger conveyors, which will eventually replace the shuttle trains between Times Square and Grand Central Station. The talk will be augmented by a film showing typical installation and test runs. A look at what lies before us will make your hair stand on end. Imagine moving on foot as fast as do wheeled vehicles.

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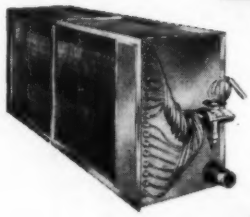

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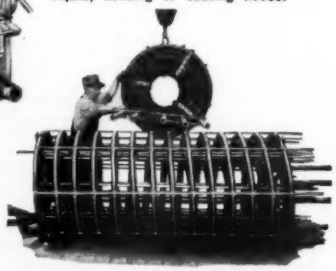

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Truck Tire Fire Tests

By Arthur B. Guise

Fires involving the large inter-city trucks have always been a problem because they can and do occur at locations where the only fire fighting equipment is the fire extinguisher on the truck. Truck tire fires are a particularly awkward problem because they are difficult to extinguish. These fires usually occur in the wide open spaces where fire trucks are not available. Not only are valuable equipment and cargoes endangered but the prevention of such fires is particularly important where the cargo consists of hazardous materials such as explosives. For this reason, the Munitions Carriers Conference of the American Trucking Associations took the initiative in planning a comprehensive series of full scale tests which would not only indicate the best means for preventing truck fires but would also give some indication as to the best extinguishers for use on truck tire fires.

Representatives of many groups were present at the tests but the active participants were the American Trucking Associations, the Munition Carriers Conference, the Tire and Rim Association, the Fire Equipment Manufacturers' Association, and the United States Army Transportation Corps.

The Army permitted the use of the Dynamometer Course at the Yuma Test Station. This allowed the tests to be run safely because no stretch of public highway was involved. The Course consisted of a two mile straightaway with one-half mile turn turnarounds at each end so that a round trip covered almost exactly five miles. Two tractors with three 32 foot cattle rack tandem axle trailers were used, with two of the trailers loaded to approximately 38,000 pounds. Thermocouples were arranged so that the temperatures of the ambient air above and below the trailer floor directly above the test tires and the component parts of the test wheel could be read either by equipment in the cab of the tractor during the run or when the check stop was made. A needle type thermocouple was used to obtain the temperature of the tires which had holes drilled at the edge of the tread. Temperature and pressure readings on the tires were taken throughout each test every 20 miles.

In addition to the equipment on the trucks there were both new nylon and rayon cord tires and old runout and recap tires. Seven different types of fire extinguishers were on hand. The United States Army furnished a 5,000 gallon water trailer, Jeeps, a wrecker, and pick-up trucks.

It was hoped that the test location at Yuma would result in high ambient temperatures which it was expected would be more favorable for the production of tire fires. Unfortunately, instead of temperatures in the neighborhood of 100°F., the range of ambient temperatures recorded in the data is from 54°F. to 72°F. Furthermore, it rained during a portion of the tests which made even more unfavorable the chances of obtaining tire fires. However, a few tire fires were obtained so that tests of fire extinguishing equipment could be made.

One of the main objectives of the tests was to determine the conditions under which tire fires started. The average speed of the trucks was 45 m.p.h. but went as high as 55 m.p.h. on the straightaway. To try to get a tire to heat, in the first test, one of the outside rear tires was completely deflated and the inside tire inflated to 75 pounds. On this basis, the truck was operated with an overload of approximately 140 per cent by Tire and Rim Standards on the remaining inflated tire. Under these conditions the temperature reached only 270°F.

In the second test the inflation pressure of the inside tire was dropped to 50 pounds and after the truck had operated for 57 miles the inside inflated tire had reached 500°F. and the outside (flat) tire 460°F. At this point the inside tire blew and the test was discontinued. The same conditions were used in a third test and after 35 miles of operation the inside tire blew again. However, the truck was parked and during this waiting period the inside tire smoked so as to indicate that the tube and flap were smoldering. After one hour the tire burst into flames. At this point, it became obvious that tire fires could be readily obtained by having one tire completely deflated and the adjacent tire under-inflated.

There still remained several problems from the standpoint of producing fires which would allow the testing of fire extinguishing equipment. A runout or "bald" tire would not heat up as readily as a new tire but once it had broken, the shreds of rayon cord would burn rapidly when ignition took place. The new tires apparently heated more readily because the heavier tread did not permit good cooling action by air while the truck was moving. Also, when a tire broke badly and the truck continued to move, the cooling action of the air resulted in the temperature of the tire decreasing after the casing had been badly broken. Nylon cord tires did not ignite apparently because the nylon cord retracted into the rubber as a result of the heat when a break took place.

Another point of basic interest in the starting of tire fires was that most of them started with the tube and flap, both of which became very hot under the running conditions. Observation indicated that tire fires would take place after the truck had come to rest if the temperature of the tread was 400°F. or over and there was a break in the tire. In no case did a tire fire occur where there was no break in the tire. In one case the tire split while the truck was rolling and the tube and flap were thrown out, bursting into flame while in mid-air.

The history of a typical tire fire would run somewhat like this: The outside rear tire (a used tire) was run flat. The inside tire was a new rayon cord which blew. By the time the truck drew

Mr. Guise, chief engineer, Research and Development Division, Ansul Chemical Company, presented this talk before the Western Society of Engineers at the Society's headquarters in Chicago, on March 22, 1955.

off the course the outside tire was thoroughly shredded. The temperature of the inside tire was 485°F. 12 minutes before it blew. This tire ignited only 15 minutes after the truck came to a standstill. The fire was allowed to burn for 2 minutes and then one 2-1/2 gallon wet water carbon dioxide cartridge pressurized extinguisher was used on the fire. There was no visible flame after 37 seconds of application. After 1 minute 30 seconds the tire reflashed. The reflash was allowed to burn 15 seconds before the second extinguisher was used and no flames were visible after only 2 seconds of application of wet water. After 4 minutes 31 seconds a third reflash took place and this time the preburn was 2 minutes 15 seconds. A third wet water extinguisher was used and no flames were visible after 25 seconds although both inside and outside tires and the nearest sections of the forward tires on the dual axles were burning intensely by the time the extinguisher was applied. The fourth reflash took place 58 seconds after the end of application and a fourth extinguisher was used to control the fire so that the tires could be removed. The tires reignited after they had been removed from the truck.

In the foregoing fire there was difficulty on getting the stream into the interior of the inside tire and the shredded condition of the outside tire caused a rapid spread of fire.

Another typical fire occurred when the truck came to a stop with the tire badly split and at a temperature of 440°F. In this case the fire was apparently extinguished by the use of one 30 pound dry chemical extinguisher. Twenty-five minutes later it reignited although the tread temperature was down to 150°F.

In an effort to determine whether dragging brakes caused tire fires, a truck was operated with the brakes dragging on the left rear side. In this type of fire, ignition occurred while the truck was in motion and extinguishers were loaded into a pick-up truck which followed until the truck came to a halt. The fire was in the grease from the wheel bearings which had been ignited by the very hot brake drums. This fire was extinguished after two 30 pound dry chemical extinguishers had been used, the first being applied intermittently for 45 seconds during which the grease reflashed repeatedly. Fifteen seconds after the end of the 45 second intermittent discharge the grease reignited again and was allowed to burn for 60 seconds before the first extinguisher was again applied for a period of 5 seconds which emptied the extinguisher. Thirty seconds after the end of application, the grease again reflashed and was allowed the very short preburn time of only 2 seconds. The second dry chemical extinguisher was intermittently discharged but the time not recorded. However, the test was declared to be at an end 22 seconds after the start of extinguisher discharge and there had been no reflash. This was technically not a tire fire because only the surface of the tires ignited and examination after the fire disclosed no signs of burning in the interior of the tire. It should be emphasized that fires involving only the outside of the tire are very readily extinguished and are caused only by external ignition sources, such as the grease fire in this case.

In another fire, the truck had stopped at the far turnaround and then started up with the tire smoking. On the way back to the check point the truck stopped for 12 minutes and the tire temperature was measured at 390°F. It took 7 minutes for the truck to proceed slowly to the check point and the temperature was then 490°F. Because of the long waiting time before tires would ignite, this tire was ignited artificially 3 minutes after the truck had stopped and allowed to burn for 2 minutes before a 15 pound carbon dioxide extinguisher was applied. Four carbon dioxide extinguishers were used with intermittent discharge over a total period of 17 minutes not counting the time of 5½ minutes waiting for reflashes to occur. After the fourth extinguisher had been emptied, no flames were visible. Because it was the end of the working day the 20 minute standard waiting time for reflash was dispensed with and the tire was removed and set aside. The next morning this tire was found to be entirely consumed.

In another case, the truck rolled in

(Continued on page 19)

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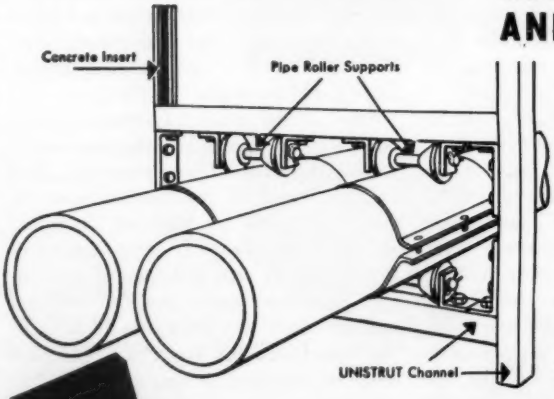

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The Laramie Avenue Bridge

By Linas H. Brown, MWSE

One of the oldest bridges in Illinois had to be wrecked to make room for a modern four-lane bridge which is now under construction in Cicero. The site is at Laramie (52nd) Avenue across the Burlington Railroad's classification yards, Ogden Avenue and 26th Street. The removal of the old bridge was a project in itself.

The old Laramie Avenue bridge was in many ways a monument to early American long-span bridge construction. There are few bridges like it still standing. This wrought iron and cast iron structure, erected at Burlington, Iowa, between 1860 and 1870 by the C. B. & Q. Railroad, was one of the first bridges to span the Mississippi River. It carried the Burlington's railroad track across the river until 1895 or thereabouts.

The advent of heavier locomotives and rolling stock made it obsolete as a railroad bridge. A new material—steel—had been found. Structural steel was cheaper, stronger, and more easily rolled into plates, angles and beams. Steel found ready use for fabricating bridges with long truss spans such as were required over the Mississippi River.

The old iron bridge at Burlington was still in good condition, so the C. B. & Q's bridge engineers thought that it could serve well as a viaduct over which horses and wagons could cross. About 1895 the four 250-foot bridge spans were dismantled, loaded on freight cars, and headed back east retracing the path over many of the same tracks they had traveled some thirty-five years before on their way from the mills where they were fabricated.

The year 1895 was 30 to 40 years before grade separations were given serious thought. Wagons and people moved slowly. Trains were relatively fast, and crossing guardsmen and gates kept the street traffic in check until the train moved by. However, the C. B. & Q. was developing a new switch yard at Morton Park, now a part of Cicero. If Laramie Avenue traffic could be carried above these tracks, there would be a saving in crossing protection, and freight trains could be assembled without any interference caused by keeping the street open.

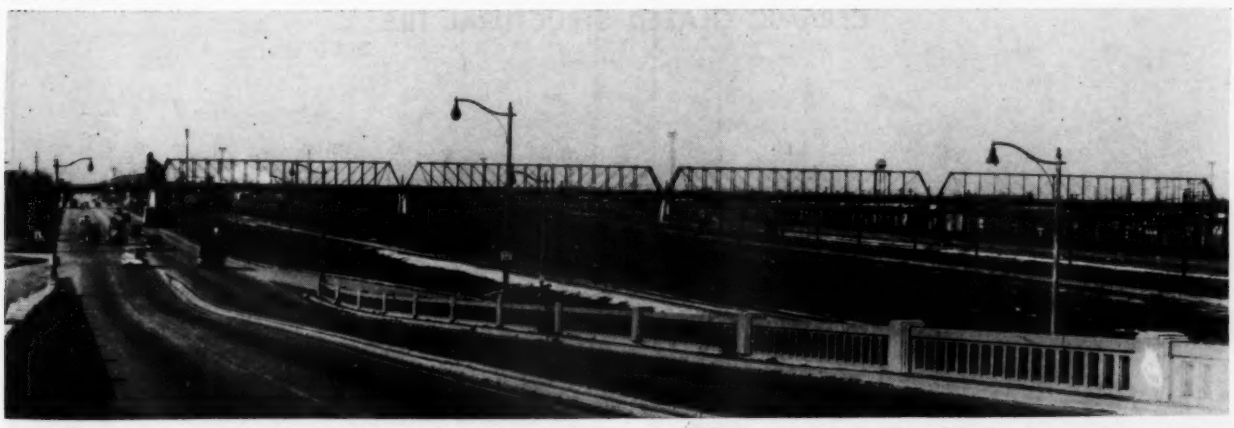
Stone piers were erected 250 feet apart, the wrought and cast iron trusses were re-erected and a plank roadway and sidewalk were laid on huge timber stringers. Short, deck type approach spans crossed Ogden Avenue and 26th Street, two State-maintained routes which bound the Burlington's yards. Earthwork ramps were built on each approach. From the ends of these solid fill approaches, structural steel spans were constructed to bridge the gap to the iron trusses. From their new surroundings the bridge looked out on prairies now becoming dotted with homes and factories of a community which was to become one of the greatest industrial centers of the world.

Like all bridges, the Laramie or 52nd Avenue bridge required extensive periodic maintenance. In 1923 the deck had to be renewed and the steel work repaired. The old iron trusses had withstood the smoke and steam of locomotives. Science had recently proven that wrought iron with its millions of glass-like fibres of iron silicate was an extremely useful material in resisting corrosion. New 4 inch x 16 inch wood stringers held up a new wood roadway which now supported the street car rails of the Chicago and West Towns Railways Company.

The next great change in the bridge utilized another newly developed engineering material, reinforced concrete. This change, completed in 1937, was financed by the State of Illinois Division of Highways. It consisted of new reinforced concrete piers and structural steel spans replacing the shorter spans and eliminating the center pier in Ogden Avenue.

In 1941 the Town's engineers made an investigation of the cost of repairing the roadway and sidewalks to make the structure usable for a few years. The railroad agreed to share one-half of the

Linas H. Brown, the author of this paper, is chief of the Municipal Department, Deleuw, Cather & Company, Chicago, Illinois.



Looking west at Laramie Avenue bridge before construction began. Structure in foreground is the Ogden Avenue overpass which carries U. S. 34 and U. S. 66 over Cicero Avenue (Illinois Route 50) and the Burlington tracks.

cost providing future repairs to the roadway, sidewalk and appurtenant fixtures would be assumed by the Town of Cicero. The repairs which were made in 1942 consisted primarily of removing the street car tracks, replacing the 4-inch plank floor, and applying an asphalt plank wearing surface. The total cost was $62,000.

By 1948 it was again apparent to the Town's president and board of trustees that something had to be done about the bridge. Since 1946 the asphalt plank had deteriorated badly, due principally to the poor condition of underlying wood flooring and, possibly, the stringers and sub-planking. The wood in the bridge was a constant nuisance, catching fire from locomotives' sparks. The Town's engineers, De Leuw, Cather & Company, estimated that at least $150,000 was needed to complete repairs. Was the old bridge worth it? Perhaps a new modern bridge would be more economical in the long run. The Town's engineers made estimates for a new bridge on the basis of 24-foot, 36-foot and 48-foot roadways. Financing was the problem. In April of 1949 the question was put to the voters. The referendum on a $1,000,000 bond issue for constructing a new bridge was defeated at the polls.

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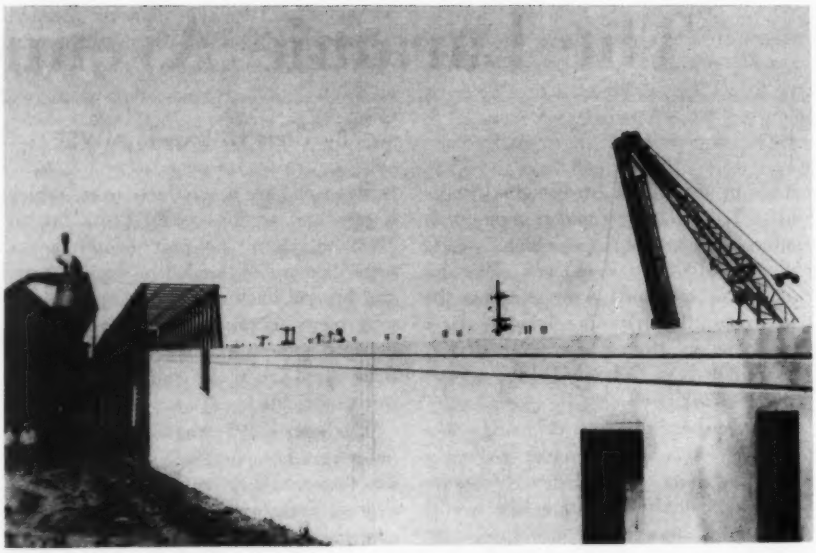

Retaining wall for north approach to new Laramie Avenue bridge, Cicero, Illinois, contrasted against remaining truss spans of old bridge seen in left rear. Recesses in wall are for electrical distribution center for bridge lighting.

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Another Seawolf Goes to Sea

When the submarine officially listed by the United States Navy as SSN 575 slipped into the waters of the Thames River at Groton, Conn., on July 21 she took her maiden dip as the proud owner of an illustrious and heroic name.

This second atomic-powered submarine of the Fleet only a moment before had been christened *Seawolf*, one of the most eminent names in the Navy's history. The new underseas fighter got her new name from two earlier subs named *Seawolf*. USS *Seawolf I* and USS *Seawolf II* were wartime submersibles. The first saw duty in the Atlantic in World War I and the second was a potent destroyer of Japanese shipping during World War II.

Seawolf I was built prior to the first World War at the Union Iron Works, San Francisco, by what was then the Electric Boat Company, predecessor of General Dynamics Corporation which built the new nuclear-powered *Seawolf*. *Seawolf II* of World War II fame was built at the Portsmouth, N.H., Navy Yard.

The first *Seawolf* was lost at sea in the Pacific in 1920 two years after her World War I duty in which she saw little action.

Seawolf II, however, compiled an outstanding record against the enemy in the Pacific during the last war.

She was commissioned in December, 1939. Two years later, on Dec. 7, 1941, she lay off the Cavite Navy Yard in Manila waiting to go into drydock for her first overhaul since commissioning. Her commander was Lt. Cmdr. Frederick B. Warder.

Following the news of the Japanese attack on Pearl Harbor, Warder took her to sea and during the next 12 months made seven war patrols with her. She proved to be a serious thorn in the enemy's side during this period largely because Warder and his men were able to overcome aggravating deficiencies which kept cropping up in our torpedoes.

The painstaking work put into the torpedo riddle by the *Seawolf's* personnel had a great bearing on the ultimate solution of the problem.

Late in 1942 Lt. Cmdr. Royce L. Gross of White Plains, N.Y., took command of the *Seawolf* and he served as her skipper during five war patrols. The peak of his activity came in January 1944 when the *Seawolf* sank no less than 23,361 tons of enemy shipping. Gross, like Warder, also had torpedo trouble but he too managed to overcome much of

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it during the nearly two years he was skipper of the *Seawolf*.

In the early summer of 1944 Lt. Cmdr. R. B. Lynch commanded the boat on a lengthy reconnaissance patrol and on a special mission in the Palau area of the Pacific. In September he turned her over to Lt. Cmdr. A. L. Bontier who took her to sea on what proved to be her last patrol, her 15th.

A bitter death came to the *Seawolf* and her brave men early in December, 1944 in the Admiralties. She was, it is now thought, the victim of an attack by our own Naval forces, presumably as a result of misunderstood signals.

During her brief life, however, the *Seawolf* was a genuine scourge to the Japanese. She sank a total of 71,609 tons of the enemy's shipping and damaged 70,000 more tons.

Today Warder, a native of Grafton, West Va., is a rear admiral in command of Cruiser Division 5 in the Pacific, and Gross, who retired with the rank of rear admiral in 1947, is at the Electric Boat Division of General Dynamics.

The new *Seawolf* was christened on July 21 by Mrs. W. Sterling Cole of Bath, N. Y., wife of U. S. Representative W. Sterling Cole.

While the new submersible derives her propulsion power from nuclear energy, as the USS *Nautilus* does, the *Seawolf's* atomic energy reactor is based on a principle which is different from that of the *Nautilus*.

The new sub incorporates the latest features of human engineering to provide the most efficient operating conditions for its officers and crew. Equipment and controls have been designed by General Dynamics engineers to reduce human errors to a minimum. Living spaces are planned to keep the personnel in top mental and physical condition.

The first keel plates of the *Seawolf* were laid down on shipways next to the *Nautilus* on Sept. 15, 1953. Thus her building time from keel-laying to launching was approximately 22 months. She will not be ready for sea, however, for some time. The *Nautilus*, christened by Mrs. Dwight D. Eisenhower on January 21, 1954, went to sea about a year after her launching.

Although she now floats in the tidal waters of the Thames at the General Dynamics wet dock she is still plain *Seawolf*. By Navy usage she does not acquire the letters USS (United States Ship) until after her commissioning. Until her christening she was listed as the SSN 575, the SSN standing for Submarine Nuclear and the 575 being her hull number.

It's early to make predictions about this submarine. But Navy people feel she is well-named as, indeed, she is. Riding with her throughout her life will be the spirits of men who rode the two earlier *Seawolves* and the good wishes of all Americans.

Model Employees Act as Models

"Model" employees are helping a national corporation to promote both employee and community relations at its six plants located throughout the country, *Factory Management and Maintenance* reports. Several girls are selected from each plant to be models for clothes supplied by local department stores. Photographs of the girls appear in both the company publication and the local newspapers, thereby giving the stores free publicity, and the employees the pleasure of seeing their pictures in the papers.

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Seven Wonders Are Announced

The American Society of Civil Engineers made public on Oct. 20, at its headquarters in New York City, the projects that a special committee of eminent members, with the concurrence of the Board of Direction, designated the Seven Modern Civil Engineering Wonders of the United States. Presented alphabetically, with no other significance in their order, they are:

Chicago Sewage Disposal System—involving Herculean excavation; reversal of the flow of the Chicago River; construction of the world's largest treatment works.

Colorado River Aqueduct — serving 66 municipalities in Southern California with a 6,000,000 population with water brought almost 250 miles, involving part canal, part tunnel, part siphon, traversing desert and mountains.

Empire State Building, New York City — tallest building man has constructed; "Queen of Skyscrapers."

Grand Coulee Dam and Columbia River Basin Project, Washington—an irrigation marvel; has world's largest hydro-electric power plant; immensely important in development of Inland Empire.

Hoover Dam, Arizona-Nevada — world's highest; design and construction introduced many conceptions accepted for dams subsequently built.

Panama Canal — "greatest of geographical surgical operations;" of distinguished service to entire world.

San Francisco-Oakland Bay Bridge—involving the most spectacular foundation job of modern times; gigantic caisson sunk to depth of 242 feet.

Criteria set by the special committee included service to the well-being of people and communities, pioneering effort in design and construction, uniqueness, beauty, size and, in some instances, extent to which a project has been copied successfully. Not all criteria applied to all nominations.

The committee, appointed a year ago by President Wm. Roy Glidden, of Richmond, Va., at the board's instance, is headed by James Kip Finch, of New York, Dean Emeritus of the Columbia University School of Engineering. The other members are Waldo G. Bowman, New York, editor of Engineering News-Record; Louis R. Howson, WSE past president, Chicago consulting engineer, vice president of ASCE; Malcolm Pirnie, New York, past president of ASCE, of the American Institute of Consulting Engineers and the American Water Works Association; Daniel V. Terrell, Lexington, dean of the University of Kentucky College of Engineering and past president of ASCE; Ralph A. Tudor, San Francisco consulting engineer and former under secretary of the U. S. Department of the Interior.

The Seven Wonders program had its inception in the Society's Centennial Year, 1952. Local Sections were encouraged to name their regional choices. They nominated more than 200 projects. These and others were considered by the special committee, which confined its area to modern achievements of civil engineering. Several hundred considered works of major importance in the nation's continuing development included many famous bridges, buildings, dams, highways, water supply works, sewage disposal systems and tunnels.

The Seven Wonders of the Ancient World were the Pyramids of Egypt, Hanging Gardens of Babylon, Phidias Statue of Zeus, Temple at Ephesus, Tomb of Mausolus, Colossus of Rhodes and Pharos Lighthouse at Alexandria. All except the Pyramids have been destroyed.

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Tunnel Assembled Like Tank

Methods formerly used in the assembly of rural water tanks have been streamlined into modern dress by the New York Shipbuilding Corporation in the construction of steel casings for the $130,000,000 Patapsco River tunnel project at Baltimore, Md.

The result, according to New York Ship engineers, is elimination of costly overhead welding and pre-rolling of steel sheets for the tubes.

The Camden yard is constructing 9 of 21 twin-tube sections, each 300 feet long, for the Baltimore tunnel.

The New York Ship methods were developed and put into practice by yard personnel soon after Merritt-Chapman & Scott Corporation, parent company of New York Ship, was awarded the $29,894,081 contract for construction of the tunnel phase of the project by the Maryland Roads Commission. The remaining 12 sections are being built at other yards. In all, 42 units of steel casing, or twenty-one double tubes, each approximately 300 feet long and 33 feet in diameter, will go into the 6,300-foot-long tunnel, which will be one of the longest in the world. In addition to its tubes and approach ramps, the Patapsco project will include upwards of 15 miles of approach roads.

The process developed at New York Ship creates a regular assembly-line production of 20-foot sections of tunnel casing. Fabrication of a section begins when nine sheets of three-eighth-inch steel, each 6 feet and 8 inches wide and 34 feet long, are laid flat on a huge deck preparatory to welding them into a single sheet. The working deck used in this phase of the operation corresponds to the inside back cover of an open looseleaf notebook. After the steel sheets have been welded together on one side, the front cover of the book-like structure is swung shut by huge cranes and the entire unit is then clamped together and turned face down. Then the rear cover is folded back, exposing the unwelded side of the large sheet, 20 feet wide by 102 feet long. These seams are welded for additional strength and the "skin" for a 20-foot section of tubing is ready for shaping.

This shaping process is accomplished on a spool-like frame developed by New York Ship's plant engineering division. Clamped onto the shaping spool, or "spider," are four T-bar rings which will form the actual frame of the completed tube unit.

The spider, with the circular T-bars attached, is lifted by crane and placed on its side at one end of the 102-foot sheet of steel. The T-bars then are squared with the end of the "skin" and welded to assure proper alignment. Two air winches roll the spider forward slowly, and yard workers weld the "skin" to the T-bars clamped to the spool. Thus the sheet steel is wrapped around the spider, as a rug is rolled up.

When the steel sheet has been welded all the way around the T-Bars, its two ends are welded together. Then the clamps which hold the T-Bars to the spider are released; the spider is drawn out and placed in position for the next unit.

As each steel sheet is removed from the book-like welding deck and placed on the working surface for attachment to the T-bars, work on assembly of another "skin" immediately starts, so that another steel sheet is waiting to be attached as soon as the spider has been removed from one 20-foot section of tubing.

Three 20-foot sections are joined, end-to-end, on the working deck, and the completed 60-foot unit is hoisted to ways normally used for the construction and launching of ships. Here, they are joined

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end-to-end until a 300-foot tube has been completed. Simultaneously and only two feet away on the same ways from the completed 300-foot unit, another is constructed.

The two tube casings on the ways are then joined by a framework of steel. Concrete is poured into forms beneath the two tubes to create a boat-like base.

Units thus completed are sealed with watertight bulkheads at each end and are launched, exactly as are ships, into the Delaware River. From there they are towed to Merritt-Chapman & Scott's "Shape-up" pier close to the site of the Patapsco tunnel.

On arival there, each twin-tube section is fitted with interior rings of concrete and stretches of roadway slab. They then will be floated into position on the surface and, by placing more concrete between the tubes, sunk into a deep trench dredged across the river bottom. These sunken tubes eventually will be covered with backfill.

As each section is sunk, it is locked to the next by divers. Starting from the shore end, the watertight bulkheads of each section are successively removed from the interior. Final interior work, including tiling, lighting and road surfacing then is completed.

Each tube of the tunnel will contain a 22-foot, two-lane roadway and a 2-foot 2½-inch walkway. Vertical clearance will be 14 feet. The tunnel will run from a point on the south side of the river, east of Childs Street in Fairfield, to the north shore, just east of Clinton Street. The tunnel will provide an express route through the southeastern and eastern sections of Baltimore, connecting Route U.S. 1 on the south with U.S. 40 on the north.

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ARBA to be Honored By Top Congressmen

With national highway legislation a peak issue, ARBA will be honored with top Congressional leaders to headline its 54th Annual Convention in Miami Beach, Jan. 11-14. U. S. Senators and members of the House, as well as key officials of Bureau of Public Roads and other Federal agencies, will discuss measures to improve the Nation's streets and roads.

American Road Builders Association President John N. Robertson, director of highways of the District of Columbia, forecast a record attendance and a national spotlight on the Convention sessions.

An enlarged Exhibit of Highway Materials and Supplies will be a colorful, instructive and popular feature of the star-studded Convention—with both the Exhibit and general Convention sessions held under the roof of the modern, spacious Miami Beach Municipal Auditorium.

Lt. Gen. Eugene Reybold, executive vice president of ARBA, said, "This will be the brightest, happiest, and most informative national meeting of ARBA in its history."

Delegates and ARBA guests at the Miami Beach Convention will include: Federal, foreign, State, county, municipal and local engineers and officials having jurisdiction over streets, highways and airports; turnpike officials and engineers; consulting engineers and engineering firms; highway contractors; publishers of technical magazines, books and papers; educators from colleges and universities and students of engineering; manufacturers and distributors of highway construction and maintenance machinery and equipment; processors and distributors of construction materials and supplies; and representatives of bonding, finance, insurance, technical and other service organizations.

A Thought

What a plight to be impolite.

Fiber Metallurgy Latest Technique

A new metallurgical technique which may lead to an entirely new use of metals has been developed at Armour Research Foundation of Illinois Institute of Technology, Chicago.

The technique—known as fiber metallurgy—is unique because it involves the use of a bulk starting form of metal heretofore not used—short metal fibers, according to Dr. Arthur G. Metcalfe, senior metallurgist at the Foundation.

Use of the technique can result in bodies with novel properties, Metcalfe says. It is possible, he explains, to make products having a wide range of porosities combined with relatively high strength and toughness.

Filter materials represent only one of the fields of potential use for fiber metallurgy products, Metcalfe points out. Use can be made of their high stiffness-to-mass ratio compared to other bodies.

Applications have been proposed in the aeronautical field. Metcalfe also anticipates metal fibers can be prepared as skeletons to support other materials having special properties. Such additions would include plastics, active catalyst masses, active battery masses, ceramics, and friction materials.

Many of the operations in fiber metallurgy are the same as in powder metallurgy, Metcalfe notes. But he cites one fundamental difference—the use of metal fibers as the starting material.

One of the outstanding properties of fiber metal bodies is that they lend themselves to felting processes similar to the Fourdrinier process used in paper making.

Here's how the felting process operates:

The fibrous material is suspended in a liquid. The fibers are felted, or matted, by pouring the suspension over a filter while applying suction action. Result is that the fibrous material remains on top of the filter while the liquid is drawn through.

After drying, the interlocking fibers, or felted material, can be processed in various ways, such as sintering, coining, or impregnating.

It can be pressed to a higher density. Or a brazing material having a lower melting temperature can be added to improve the strength and ductility after a suitable heat treatment.

Tests conducted at the Foundation to compare the tensile and impact strength of fiber and powder metallurgy products have shown the fiber metallurgy bodies have some significant advantages over powder products.

The properties of fiber metal bodies can be adjusted by controlling the methods of manufacture, according to Metcalfe. For instance, the selection of the proper wire diameter and length can be very important in developing the desired properties, he explains.

In the aeronautical field, the higher ratio of strength-to-porosity of fiber metal bodies compared with porous powder metal bodies favors its use as part of the airfoil—for example, in the de-icing systems now using porous metals to distribute the de-icing compound uniformly over the wing edge.

Another such use might be in "boundary layer" control, in which the movement of air through the wing surface is used to preserve streamline flow giving increased lift and reduced drag. Another may be for transpirational cooling of jet engine components.

The fiber metallurgy process will be available to industry on a license basis.

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He that riseth late, must trot all day, and shall scarce overtake his business at night.

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Work Skills Concern Mitchell

Secretary of Labor James P. Mitchell has termed the deterioration of the level of work skills among the American people a factor that could "sharply curtail our technological development, weaken our domestic prosperity, and undermine our position of leadership in the world."

Writing in the October issue of the *American Engineer* magazine Secretary Mitchell declared that serious shortages of "skilled mechanics and technicians who can develop the products of the scientist's discovery and the engineer's design" must be remedied if the country's work force is to keep pace with a "complex and constantly evolving technology."

"Today there are but nine million skilled workers in a total civilian force of 64 million," Mitchell stated.

The cabinet official strongly criticized certain attitudes and practices which, he said, definitely inhibit the "development of our human resources in terms of work skills."

Secretary Mitchell listed these things as: severe educational deficiencies in some parts of the country; discrimination against Negroes and women in apprentice training; discrimination against employing workers over 45; and haphazard and ineffective inplant training programs.

He stated that the overcoming of these obstacles in the road to building up our technical skills was a "challenge to every segment of our society."

"The more complex the industry of our country becomes, the more important the skill of each American worker is going to be, both in terms of his economic security, and to his country in terms of peacetime prosperity and national security," he stated.

He predicted that "within the next 25 years, the discoveries of modern science will make it necessary for almost every worker to possess a certain amount of skill, based on training and experience."

Pointing out that the "hope of the free world" may depend on the "skills of American artisans," Secretary Mitchell urged that these work skills be "cultivated with direction and perspective and we must begin now."

The Secretary's article quoted extensively from figures released by the Armed Forces showing the relationship between educational level and the development of technical skills.

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The prediction was made Oct. 20 by Mones E. Hawley of the Radio Corporation of America, at the National Noise Abatement symposium at Armour Research Foundation of Illinois Institute of Technology in Chicago.

Speaking before approximately 300 industrialists, civic leaders, and scientists, Hawley discussed the development of an electronic sound absorber at the RCA laboratories at Camden, N.J.

"The electronic sound absorber is a device which consists of a microphone, an implifier, and a loudspeaker connected to form an electroacoustic feedback system that reduces sound pressure variations in the vicinity of the microphone," he explained.

Possible applications of the new device are:

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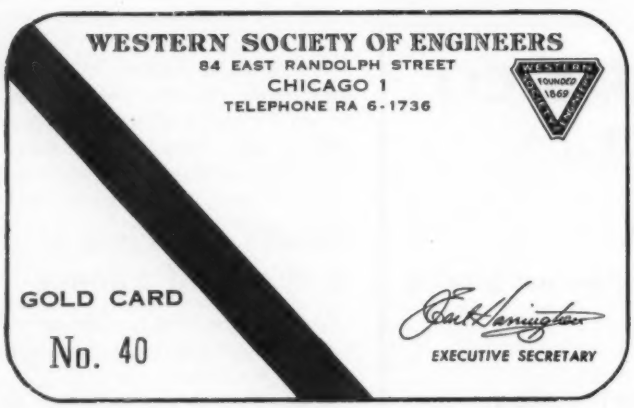

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WSE Annual Fall Dinner

"Building Better Business Through Engineering"

Pictures of Prominent Members in Attendance.

Above (left to right): Robert S. Hammond, James D. Cunningham, and O. G. Smith. Below (left to right): John P. Gnaedinger, Charles L. Mee, and A. D. Bialey.

Below (left to right): John T. Rettaliata, Alf Kolflat, Williám R. Marston, Joseph Kucho, and Robert H. Bacon.

The Western Society of Engineers held its Annual Fall Dinner at the Furniture Club of America in Chicago on Oct. 13.

The evening's theme was "Building Better Business Through Engineering." Two nationally recognized authorities in their fields, and both members of the Western Society, spoke on the theme as it applied to their phase of engineering.

James D. Cunningham, MWSE, president of Republic Flow Meters Co., past national president of the American Society of Mechanical Engineers, and past president of the Illinois Manufacturing Association, touched in his talk, in addition, on the American stake in the Eastern World. He has just returned from the Orient, having been there on a business trip.

John T. Rettaliata, MWSE, president of the Illinois Institute of Technology, considered in his talk the ever-increasing importance of a sound educational program as it applies to building better business.

The Western Society's Annual Fall Dinner was dedicated as a salute to the American Society of Mechanical Engineers on the latter's 75th anniversity. ASME is holding its Diamond Jubilee Meeting this month in Chicago. ASME's jubilee theme is "The Engineer in the World of Commerce and Industry."

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Truck Tire Fire Tests

(Continued from page 4)

with the left rear outside tire in very badly shredded condition and the inside tire flat and badly damaged. The temperature of the outside tire was over 600°F. The tire was ignited by using a match instead of waiting for ignition. The fire was allowed to burn for 2 minutes. One 2½ gallon foam extinguisher was used. There was no visible flame at the end of 5 seconds and there was no reflash. In this case, the extremely shredded condition of the tire allowed the stream of extinguishing fluid to easily reach the interior of the tire and there were no difficulties.

There had been some discussion of the possibility that if a tire fire occurred the driver of the truck could continue running and thereby extinguish the fire. In the test of this theory, the fire started with the truck at the far turnaround and was very slow in spreading so that after waiting for 10 minutes it was decided to drive to the central check point. Three 2½ gallon loaded stream carbon dioxide cartridge pressurized extinguishers were used, one after the other and at the end of this application there were no visible flames. However, the tires reflashed 35 seconds after the end of application. The reflash preburn was only 15 seconds and then the fourth extinguisher was used intermittently by the operator shutting off the nozzle with his thumb. There was no reflash after the fourth extinguisher had been used and the fire was either completely extinguished or very close to extinguishment. However, because the trailer platform had been involved, the water truck was brought up and used to wet down the trailer.

In this case the outside tire was flat and well broken away from the bead so that when the truck came to a halt there was easy access to the interior of the tire. The inside tire was inflated and did not blow out until the truck had come to a halt and fire fighting was in progress. The blowout opened a sidewall tear 10 to 15 inches in length and 2 to 3 inches wide. By the time the first extinguisher was used, both left rear tires were fully involved, the front rear tires were involved slightly after the truck came to a stop, and a portion of the trailer platform was also in flames.

It was very quickly decided that there would be no more attempts to try to extinguish a tire fire by "running it out."

There were other tire fires in which one gallon stored pressure vaporizing liquid carbon tetrachloride base extinguishers were used. In one case, the initial tire temperature was over 600°F. and this fire was extinguished by the use of four of these extinguishers.

There were two attempts to extinguish tire fires without the aid of fire extinguishing equipment. In one case, asbestos blankets were used and in the second case a metal shield with asbestos skirts and provided with a connection so that the exhaust from the truck or an adjacent car could be used to provide inert gases. In both cases the flames were covered but the temperature of the tire continued to rise and when the covers were removed, the intensity of the fire was far greater than normal.

It is obvious that tire fires can be prevented by proper preventive measures such as checking the inflation pressures at regular intervals, and the driver making a periodic mirror check of the tires for smoke while under way. It also became obvious that the tires rarely burst into flames immediately after the truck had come to a stop but required a waiting period before ignition took place.

The following are the conclusions of the report of the Fire Extinguisher Manufacturers' Association:

1. When a truck comes to a halt with a flat or smoking tire, the driver should immediately attempt to remove the tire and while doing so should have an extinguisher immediately available. The extinguisher should be used to control any fire which may occur so that the tire may be removed. It is understood that if there is only one lug remaining to be removed and this is not readily possible with the tools that are available, that it would be possible to break

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the lug by moving the truck so that the tire will drop off and thereby save the trailer and cargo.

2. In order to maintain control of the fire while the tire is being removed, extinguishers for truck protection should be so designed as to allow intermittent operation and effective retention of the charge over an adequate period of time. This is presently accomplished with carbon dioxide extinguishers by squeeze-grip or trigger-operated valve design, with dry chemical extinguishers by squeeze-grip valve operation on stored pressure extinguishers and by shut-off nozzle on carbon dioxide cartridge operated extinguishers, and on stored pressure vaporizing liquid extinguishers, the intermittent use and more prolonged retention of the charge is accomplished by using the valve and the nozzle shut-off. Other types of extinguishers would require modification in design to meet these requirements.

3. The nozzles on liquid type extinguishing agent extinguishers should be designed to provide either a straight stream or a spray, the spray being particularly effective in rapid knock down of the flames and the straight stream being used to more easily get the extinguishing agent into the interior of the tire through the breaks in the sidewall.

4. No conclusions can be drawn as to the relative effectiveness of the extinguishing agents because of the wide variation in the test conditions.

5. Adequate data was obtained from the tests to allow the reproduction of practical test fires under carefully controlled laboratory conditions for the evaluation of extinguishing agents. It appears that the temperature of the entire tire and tube needs to be in excess of 400°F. and the interior of the tire needs to be exposed by an opening in the tire, for a fire to occur.

6. These conclusions do not take into account problems which are encountered in the use of extinguishers on trucking equipment. Good inspection and maintenance procedures are recommended to insure continuing fire protection.

Freight Planes?

Fighter planes carry over 2,400 pounds of electronic equipment today, as compared to 1,500 pounds of the gear ten years ago, according to *Electronics*.

Laramie Bridge

(*Continued from page* 6)

The only alternative was to proceed with major repairs to the old bridge. For the next seven years these repairs were made with the same futility of a housewife repairing a pair of thoroughly worn hose.

On April 6, 1954, another referendum carried and $1,875,000 was voted with the understanding that the Burlington would contribute one-fourth of the cost or $625,000 of the $2,500,000 estimated for construction, right-of-way, engineering and legal costs.

The removal of the four spans, each composed of two modified Pratt trusses, has presented problems of engineering to the contractor, to the consulting engineer and to the Burlington Railroad. Maintenance of railroad traffic has been, of course, second only to safety as far as the C. B. & Q. was concerned. The Burlington has an excellent record of continuous payments of stock dividends of which every member of the railroad seems proud.

The contractor used the beams across Ogden Avenue as an important part of his falsework in removing the trusses. These 36-inch wide flange 194-pound stringers were tied to the old floor beams by means of one-inch round bars. Because of the clearance requirements, it was necessary to place these 36-inch beams over the old floor beams rather than under them where they would foul the train traffic which must be maintained during construction. A Manitowoc 30-ton crane with a 60-foot boom erected the falsework and lowered the freed pieces which were burned from the old bridge trusses. Both east and west trusses were removed together. Demolition proceeded longitudinally, with no lateral bracing removed more than one panel ahead of the panel being demolished.

The Burlington railroad spotted gondola cars so that the crane could lower pieces cut off from the truss directly into these low-slung freight cars 45 to 60 feet

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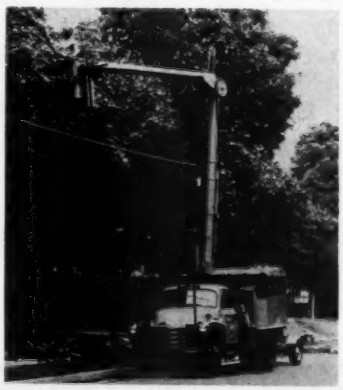

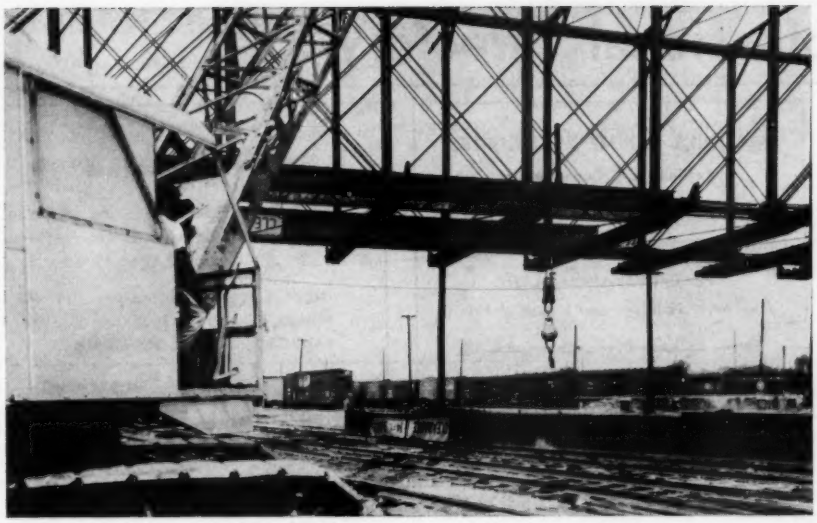

Erecting 36-inch, wide-flange beams which formerly spanned Ogden Avenue. The girders serve as part of the falsework in the removal of the 250-foot truss spans of the Laramie Avenue bridge.

in length. The Commercial Salvage Company of Chicago bought the scrap and shipped it to the Bay Steel Corporation. Here, in expansive storage yards at 47th and Morgan streets in Chicago, it was sorted out before it was shipped to the United States Steel Corporation's and Inland Steel Company's mills in the South Chicago area. U. S. Steel and Inland use 20 to 80 per cent scrap (depending on the respective prices of pig iron and scrap) to make new steel.

The Midland Structural Steel Company of Allied Structural Steel Companies has placed its orders for the new steel plates and angles which will make up the seven-foot deep continuous girders for the new bridge. The steel will be rolled by U. S. Steel and Inland. So, it is possible that some of the old bridge may return to the Laramie Avenue site. It is estimated that about 70 million gross tons of scrap will be used to make steel in 1955. Over 800 tons will come from the old Laramie Avenue bridge across the Burlington's tracks in Cicero.

The general contractor for the project is the Thomas McQueen Company of Forest Park. Sub-contractor on removal of the old trusses was the Overland Construction Company of Chicago.

Ernest Sporry is McQueen's superintendent. Overland's project manager was John R. Rome; Kenneth L. Blakely was superintendent. C. F. Mueller, MWSE, structural engineer for Overland, designed the falsework. Linas H. Brown, chief of the Municipal Department of De Leuw, Cather & Company, engineers, is project manager. L. Nordlow Rian, MWSE, is structural engineer and Thomas Ek, MWSE, and Dan Kent are resident engineers.

"How to Listen" Is New School Subject

How-to-listen is one of the subjects being taught at a new school established by a manufacturing concern for its employees, according to *Industrial Distribution*. Pointing out that 45 per cent of all time spent in communications is devoted to listening, the firm believes the average persons only half-listens, while the mind races ahead about four times as fast as the other person talks.

Steel Needs Water

Production of one ton of steel takes 65,000 gallons of water, according to *Electrical World*. One automobile takes about 15,000 gallons; a pound of aluminum requires 160 gallons; and one gallon of gas needs 23 gallons of water.

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Altitude Called Factor In Academy Design

High altitude was a factor in the architectural and engineering designs of the buildings at the new Air Force Academy, Edward A. Merrill, MWSE, of Colorado Springs, stated Oct. 24 at the national convention of the American Society of Civil Engineers.

Merrill, associate partner in Skidmore, Owings & Merrill, noted that "initial major construction will occupy areas as high as 7,600 feet" and added:

"The campus descends in natural terraces from the dominating knoll on which the chapel is placed to the administration level, then, in turn, to the academic campus, the parade grounds and the athletic fields and buildings. We have utilized the differences in elevation to plan a five-story quarters building which will have only two flights up and two flights down from the campus level —a consideration when climbing stairs at 7,000 feet."

Merrill said it was decided that academic and housing installations be kept, if possible, at least two miles away from the runway center line to minimize the jet plane noise nuisance. He emphasized the importance of the aerial mapping program by the U.S. Geological Survey of Denver, and the study made of geological conditions by the consulting firm of Moran, Proctor, Mueser & Rutledge, of New York.

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In accordance with the By-Laws of the Western Society of Engineers, the following names of applicants are being submitted to the Admissions committee for examination as to their qualifications for admission to membership into the Society in the various grades, i.e., Student, Associate, Member, Affiliate, etc. All applicants must meet the highest standards of character and professionalism in order to qualify for admissions, and each member of the Society should be alert to his responsibility to assist the Admissions committee in establishing that these standards are met. Any member of the Society, therefore, who has information relative to the qualifications or fitness of any of the applicants listed below, should inform the Secretary's office. The Secretary's office is located at 84 East Randolph Street. The telephone number is RAndolph 6-1736.

27-55 Wayne C. Y. Teng, Design Engr., Sargent & Lundy, 140 S. Dearborn St.

28-55 Roy K. Bey, Field Engr., Joseph Goder Incinerators, 4241 N. Honore St.

29-55 Morris T. Carpenter, Administrative Dir. of the Research Dept., Standard Oil Company (Ind.), 910 S. Michigan Av.

30-55 Roy A. Nelson, Field Engr., Simplex Wire & Cable Co., 564 W. Monroe St.

31-55 Edward J. Archibald, Supt. (Constr'n.), Lake States Engineering Corp., 53 W. Jackson Blvd.

32-55 Paul Hedden, Assist. Exec. Director, Chicago Plan Commission, Room 1006, City Hall.

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Educator Seeks for Best Type Engineer

In the shortage of engineering students, educators must seek the best possible quality of graduates, Linton E. Grinter, MWSE, dean of the Graduate School, University of Florida, on Oct. 24 urged upon the convention of the American Society of Civil Engineers in New York.

Dean Grinter, who is past president of the American Society for Engineering Education, said:

"Since a large percentage of engineers eventually enter the realm of administration, one cannot feel comfortable about the lack of emphasis on the humanities and social sciences that has been particularly characteristic of our civil engineering curricula. We must drop the confused thinking that has accepted technical non-engineering courses such as accounting, business or city management, cost analysis, marketing, finance, engineering economics or ROTC as adequate substitutes for humanistic and social courses.

"When engineering educators face the issue that humanistic and social courses may be of the same order of importance as engineering science in the curriculum of engineering and that engineering art is useful primarily for illustrating applications of engineering science, we will have improved engineering curricula and will graduate stronger potential engineers.

"Since we can no longer hope to meet the demand for numbers of graduates, it is toward quality of graduates that our engineering schools should now strive. The engineer must live his entire life among men. Unless we have given due attention to the education of the entire man, which means much more than the development of a strong technologist, we may have failed both the engineer of the future and the world itself."

A Real Pill

Detergent pills for car washing will soon be in national distribution, *Chemical Week* reports. Packed 12 tablets to a tube, the product is claimed to leave the wax intact on the car. One pill, dropped into a bucket of water, makes enough foam for one wash job.

Reviews of Technical Books

Bearing Lubrication

Bearing Lubrication Analysis, by Robert R. Slaymaker, John Wiley & Sons, New York 16, N.Y. 1955. 108 pages. Price $5.00.

Dealing primarily with sleeve bearings, the new book also goes into the general principles of bearing design.

Professor Slaymaker's treatment is broad enough to enable the design of bearings in simple cases, or the handling of important preliminary plans for more complex applications. Among the features in his book are an outline of hydrodynamic theory as a guide to the design of bearings lubricated from an external source, a discussion of the characteristics of various bearing materials, and an analysis of oilless bearings. Oil viscosity is stressed throughout the volume. In this connection, Slaymaker presents a practical method of predicting temperature rise and oil viscosity in one operation—a method drawn from the author's award winning ASME paper and appearing for the first time in book form.

Chapter headings in *Bearing Lubrication Analysis* include: viscosity and other properties of oil; hydrodynamic journal bearings (load-carrying capacity, friction torque, and oil flow and temperature rise); examples of sleeve bearing design; bearing materials, construction, and life; and boundary conditions, the coefficient of friction, and oilless bearings. A large scale viscosity chart is included on the inside back cover of the book.

DMT

Dimensional Motion Times by H. C. Geppinger, John Wiley & Sons, New York 16, N.Y., 1955. 100 pages. Price $4.00. This is the first book-length report on this new form of motion time study.

The book approaches the accuracy of the blueprint by relying fully on facts—dimensions—and avoiding human judgment and descriptive definitions. Since the book's time values, relating to dimensions, are self-contained, complete, and final, no adjustments or build-ups by the analyst are necessary.

To clarify this practical system, the new book makes available concise terms for specifying and recording work details by motions, and for predetermining the necessary manual time of operations by motion times. The author provides a set of terms by whch uniformity of anlysis and measurement is assured. He also includes complete examples of application and describes how motion times are affected by engineering, methods, and material changes.

In the past, Geppinger points out, such relative terms as "small," "large," "easy," "difficult," "loose," or "tight," although implying measurement, were actually subject to chance. Precise meaning through dimensional terms can now be applied. With such refinements, it is possible to determine and justify manufacturing methods more closely, and to verify the revision of standards.

Aeroelasticity

An Introduction to the Theory of Aeroelasticity, by Y. C. Fung, John Wiley & Sons, New York 16, N.Y., 1955. 490 pages. Price $10.50.

Offering a systematic study of the subject, the new book provides a composite picture of various aspects of aeroelastic problems. Dr. Fung first discusses some fundamental concepts in mechanics, and then introduces the main features of aeroelasticity through a consideration of problems in civil and mechanical engineering. In its first major division, the book also contains the historical background of aeroelastic problems, basic physical concepts, and the principles of analysis, while the second part of the volume deals with the fundamentals of oscillating airfoil theory, and contains a brief summary of experimental results.

Individual chapters cover some aeroelastic problems in civil and mechanical engineering, divergence of a lifting surface, steady-state aeroelastic problems in general, flutter phenomenon, fundamentals of flutter analysis, engineering flutter analysis and structural design, transient loads, gusts, buffeting and stall flutter, applications of Laplace transformation, general formulation of aeroelastic problems, fundamentals of nonstationary airfoil theory, oscillating airfoils in two-dimensional incompressible and compressible flow, and unsteady motions in general.

Dynamics of Machinery

Dynamics of Machinery by A. R. Holowenko, John Wiley & Sons, New York 16, N.Y., 1955. 464 pages. Price $7.50.

Generally concerned with background information for the design engineer, the new book takes up the two initial considerations in design: kinematics and force analysis.

The basis of Holowenko's study is Newton's laws, the relative velocity equation, and the relative acceleration equation. Starting with velocity analysis, the volume leads to dynamic analysis; this latter is made with separate or combined static and inertia force analysis, and an interpretation is supplied of the two separate force analyses.

Holowenko has broken the analyses into parts, showing a step by step construction, with final results demonstrated only after the steps have been discussed and explained in a series of isolated figures. He also concentrates on the development of relations, using both analytical and graphical proofs where one supplements the other. Further clarity is achieved through the constant use of free body diagrams and pointing out the relationship of equations to graphical solutions.

CTA Opens Operating Station

Chicago Transit Authority's third new operating station, named Forest Glen for a northwest section of Chicago, is scheduled to open Sunday, Dec. 4, as the operating base for 12 trolley bus and motor bus routes, Walter J. McCarter, CTA general manager, has announced.

Built at a cost of $2,500,000, the new terminal facility is located on the north and south sides of Armstrong ave., just east of Elston ave. It consists of a service and maintenance plant and motor bus storage yard on the north side of the street, and trolley bus storage yard and a transportation office building (the latter is soon to be constructed) on the south side of the street.

"Opening of the new Forest Glen facility will improve service in the northwest area because of the added efficiency with which we can dispatch and service equipment at this location," said McCarter. "It will enable CTA to make additional mechanical department savings, bus mileage savings and will ease congestion at other northwest side stations presently storing and servicing equipment of the 12 lines which will be transferred to the new station."

Covering 11 acres, the new installation in addition to complete servicing facilities, has two completely-paved storage lots which, respectively, are capable of accommodating 175 trolley buses and 200 motor buses, enough to take care of expanded service requirements.

The new operating station incorporates many of the features of the two other new all bus terminals erected by CTA since World War II—Beverly station at 1345 W. 103rd street, and North Park station, 3112 W. Foster avenue. In some instances, maintenance and servicing facilities have been improved at the new installation, based on experience gained from operating the other two stations.

The 12 northwest side routes which will be transferred from other stations and based at the Forest Glen facility are Central, Lawrence, Montrose and Irving Park trolley bus operations, and Austin, Milwaukee, North-Narragansett-Irving Park, North Cicero, Higgins Road, Foster-Central, Harlem and Elston motor bus lines.

Coincidentally with the opening, new service in non-rush hour periods will be provided on the Central avenue trolley bus route for a distance of one-half mile from its present Milwaukee avenue terminal northward to the Forest Glen terminal. Service on the other 11 routes using the new terminal will remain unchanged.

Production-line type of servicing will be a major feature at the new bus terminal, according to McCarter. Facilities provide for speedy and efficient handling of vehicles throughout all the operational procedures necessary properly to maintain passenger equipment in day-to-day use, he said.

Four undershelter islands will be available for checking fuel, oil and air in tires. Each is equipped with fuel dispensers and drop hoses for providing the necessary servicing. Each island also has a "king-size" vacuum unit for a quick cleanup of interiors of buses. Provisions are also made for steam and air-cleaning of undersides in a nearby area. In addition, an automatic bus washing machine, inside the building, will quickly clean the exteriors of buses. A second washer of this type will be installed in an outside area on the south side of Armstrong Avenue when the Transportation office building is constructed.

An area with four inspection pits, each capable of handling four buses at a time; a maintenance area with ten hoists which can easily lift buses for servicing, including tire replacement, and repair and degreaser areas are located in the service building. Other features include a parts storage area; tire area; two battery charging areas and a switchboard room.

Safety was a paramount consideration in the designing of the building. Construction features include safety lighting in various parts of the building; a sprinkling system designed to work if the temperature rises above 140 degrees, and a fan system which channels all exhaust out of the building.

Offices, a lunchroom with a capacity of 140 persons, and a locker room with shower and sanitary facilities are located in the service building.

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Whisler Warns on Engineer Training

"We are approaching the point where our students will be trained only as scientists and not as engineers," the national convention of the American Society of Civil Engineers was warned Oct. 24 by Benjamin A. Whisler, head of the Department of Civil Engineering, Pennsylvania State University.

"Present trends in engineering education are toward the inclusion of much more mathematics, physics (including atomic physics), theoretical mechanics and similar courses," said Whisler. "These courses are being expanded in order to prepare the graduate engineer for entry into development and research activities and are at the expense of those courses which emphasize the truly engineering aspects of the curricula."

"The practice of engineering is a combination of art and science. Many problems cannot be solved by straightforward application of mathematical and physical principles but must depend on judgment based on experience. For many reasons such judgment must be used much more by the civil engineer than by engineers in other fields. He works with extremely variable and incompletely understood materials such as soils. He is prevented from using the best engineering solutions because he must satisfy the desires of non-engineering public authorities such as municipal councils and elected officials, and he is restricted by antiquated building codes.

"Consequently he is continually required to make decisions which represent compromises with the theoretically best solution to a problem. The educational institution can do little to provide the experience needed to make such decisions, but it should do everything it can to provide a basis for making such judgments by indicating to the student the part such judgment plays in the work of the engineer and by providing in his education the opportunity for exercising judgment based on his limited experience and knowledge.

"Such training cannot be part of basic courses in mathematics and physics but must be part of the advanced courses at the junior and senior level in which the principles of science are applied to specific, practical engineering problems."

Columbia Technology Lab First in S. A.

Research aimed at broadening the economic base of Colombia has been launched with the opening of the South American nation's first laboratory center specifically for technological research.

The center was established in Bogota by the Agricultural, Industrial and Mining Credit Bank of Colombia, with the technical assistance of Armour Research Foundation of Illinois Institute of Technology, Chicago.

The start of operations marked the completion of phase one of the project which included a study of the agricultural industry's technology, with particular attention to the solution of problems through research and engineering methods.

"Primary objective of the study was to determine the direction for the development of the country's economy," explained Paul B. W. Gollong, MWSE, manager of ARF's international department.

The investigation, conducted by Dr. Paul J. Kolachov, the Foundation's resident adviser at the Bogota laboratory, indicated Colombia should rely primarily on development of its agricultural potential.

"This development is designed to improve and to increase the use of agricultural products as raw materials for industry," Gollong pointed out.

Phase two of the project is concerned with organizing the laboratory itself and translating phase one recommendations into reality.

Here's An Idea That's No Flat Tire

With flat tires becoming a rarer occurrence, there is talk of dropping the spare tire from new cars, *National Petroleum News* says. With motorists used to a spare's extra protection, this would mean a potential 20 per cent gain in the retail replacement tire market.

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Mobile Purifier Aids in Disaster

Ninety nine thousand gallons of drinkable water were produced and distributed by the Army's new mobile purifier during nine days of emergency operation in August in flood-ravaged Stroudsburg, Pa.

Developed by the Corps of Engineers' Research and Development Laboratories, Fort Belvoir, Va., the truck-mounted unit is capable of purifying 3,000 gallons of water an hour, 24 hours a day. A six-man team of water experts headed by Harry N. Lowe, Jr., Chief of the Laboratories' Sanitary Engineering Branch, worked 13 hours a day to produce quality water in quantities exceeding the demand. This did not require working the unit at full capacity.

Dispatched to Northeastern Pennsylvania at 2 a.m. on the morning of Aug. 20, the group arrived in the Pocono resort town two days later, after assisting in the establishment of an emergency water supply in stricken Scranton.

The unit, which is nearing standardization by the Army, is a member of a "family" of purifiers which resulted from years of basic and applied research at the Laboratories. Other units include 1,500 and 600 gallon-per-hour capacity mobile purifiers, and a semi-permanent one capable of producing 10,000 gallons of drinking water each hour.

Heart of the purifiers is an "erdlator," an all-metal solids contact clarifier which chemically coagulates and removes mud, bacteria and other suspended matter in the water and makes effective disinfection possible.

This up-flow coagulation basin is connected in series with diatomite filters. The combination not only removes silt and destroys bacteria, but also provides positive physical barriers to the passage of organisms which cause dysentery and "schistomiasis," a serious water-borne disease found in the Far East.

Polluted water can be pumped into the units and chemically and physically treated and discharged as potable water in approximately 20 minutes's time.

Excellent performance and short detention periods of the units are attributed to the use of pulverized limestone, which is almost universally available and costs less than $12.00 a ton.

Only one man is required to operate each unit and it can be put into operation by three men in less than 90 minutes after arrival at a selected site. Equipped with its own power source, it can be operated in total blackout. The only noise audible is from the engine driving the generator.

Some of the nation's most strategic waters, partially contaminated by industrial and domestic waste have already been purified by the units. The Virginia State Department of Health cooperated with the Laboratories in conducting engineering tests on pilot models at Emporia, Portsmouth, Newport News, Williamsburg and Richmond. Water at each site presents unique purification problems.

Service tests were held at Bear Lake, Utah; Lake Springfield, Ill.; Fort Churchill, Canada; Yuma, Ariz.; and the Mississippi, Illinois, Ohio and combined Mississippi, Missouri and Ohio rivers. These tests answered many of the Army's problems not previously solved during engineering tests in Virginia.

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Trailer Launches New Portable Bridge

A special trailer has been developed by the Corps of Engineers' Research and Development Laboratories, Fort Belvoir, Va., to transport and launch a complete bay of the Army's new division floating bridge.

Towed by a standard 5-ton bridge truck, it features a tilting bed with rollers which facilitate the launching of an assembled bay into the water.

The rollers can be locked to prevent rotation while transporting a "ready" bay, and retracted to provide a flat bed for an unassembled bay of bridge.

After the bay slides into the water, a power boat is used to retrieve it and maneuver it into position. Boats can also be hauled and launched by the trailer.

Construction of complete bays on trailers in a rear assembly area eliminates the need for a crane at the site and speeds erection at rates never before approached with the bridge.

Ceramics—Answer to Corrosion

American industry can make great strides in its $10 billion fight against corrosion through wider application of high temperature ceramic coatings, Nathaniel Cannistraro, general sales manager of the Bettinger Corporation, said Oct. 6 in a speech to the National Association of Corrosion Engineers at the Beaconsfield Hotel in Brookline, Mass.

"Atomic energy and the tremendous progress being made with this new power source in the industrial field provide an ever-growing area of use for the high temperature ceramics," Cannistraro declared. "The high-heat and corrosion-resistant qualities of these coatings and their excellent decontamination properties make them valuable in industrial processes making use of nuclear energy."

"High temperature ceramics are being used successfully in jet aircraft engines to extend the life of metals exposed to extremely high temperatures." These same coatings can be used in innumerable other cases where corrosion and heat are a destructive force, according to Cannistraro.

"The ceramic coatings originally were developed for two primary purposes: to protect metals at higher operating temperatures than they could normally stand without rapid oxidation or corrosion; and to allow use of thinner stock, to save critical materials, by providing extra protection and elevated temperatures."

Through use, many additional advantages of the high temperature ceramic coatings have come to light. Maintenance costs of ceramic-treated metal parts have been reduced and the useful life of many metals has been extended.

Cannistraro urged engineers in all fields to consider the potential of ceramic coatings as applied to their particular specialty. In all production fields using metals subject to oxidation and corrosion, such as automobile parts, heating systems and furnaces and chemical and oil systems, he said, the future of high temperature ceramic coatings should be expanding. Bettinger now is prepared to assist all phases of industry in the fight against corrosion, he declared, and industry should seize upon this opportunity.

Cannistraro's company, the Bettinger Corporation of Waltham, Massachusetts, has been one of the pioneers in the high temperature ceramic coating field. Bettinger has gained wide experience in coating parts for military use, including aircraft engine nuzzle boxes, flame holders, flame mufflers, oil refinery tubing, part trays used in heat treating, nichrome elements and collector rings. Another practical application doubled the life of annealing furnace tools that formerly needed replacement every 30 days.

Pointing out that corrosion is one of industry's major enemies today, Cannistraro told the engineers that it should be a principal concern of industry to eliminate this problem. He said that significant gains are being made along these lines, as evidenced by estimates from other officials of the ceramics industry that by 1960 most major exposed steel parts produced in this country will be protected by high temperature ceramic coatings.

High Octane Gasoline Nearly Outdoes Itself

Motor gasolines are being improved so rapidly that refiners are becoming concerned about how they are going to measure their anti-knock qualities in the next few years, according to *Petroleum Processing*. Some oil companies are expected to introduce 100 octane fuels by 1958 and this is where the problem comes up, since the highest octane that can be measured by present methods is 100.

Atlantic City Is Host To Conditioning Meet

Professional engineers will find many features of the 9th Air Conditioning & Refrigeration Industry Exposition of outstanding interest this year, according to F. G. Coggin, of Detroit Controls Co., Detroit, chairman of the exposition committee.

The show, the first to be held in the East since 1949, is scheduled for Atlantic City, Nov. 28 to Dec. 1.

The exposition, which will be the largest in its history, will have on demonstration, 6,000 pieces of equipment and parts, valued at almost three million dollars. A force of some 3,000 experts, the largest group of top engineers and executives in the air conditioning and refrigeration field ever gathered, will be on hand to answer visitors' questions.

"Professional engineers are finding that an increasing number of problems can be met when air conditioning or commercial refrigeration systems are suggested," Coggin said.

"Increased production, lowered maintenance cost, quality control, employee comfort, lessened inventory loss, and more efficient use of space are only a few of the elements which go into the solution of engineering problems through use of air conditioning and refrigeration.

"Displays will show not only completed units but also component parts. Thus engineers will be able to learn at first hand every new development in the field. A huge army of experts will be present to answer all questions and professional engineers will find a special welcome for them at the show."

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New Stainless Steel Grade Is Described

A new grade of stainless steel containing little or no nickel was described Oct. 11 in a paper read before the Cleveland regional technical meeting of the American Iron and Steel Institute.

Dr. Dennis J. Carney, author of the paper, is superintendent of No. 2 electric furnace department at U. S. Steel's South Works in Chicago, Ill. A patent application has been filed on the new product which was developed through studies aimed at conserving nickel, currently in short supply.

According to the author, more nitrogen is used in the nickel-free and low nickel stainless steels than was thought possible prior to the study. He asserted that by the proper adjustment of the chemical composition of the steels—particularly with regard to the chromium and manganese contents—sound ingots can be made with a nitrogen content of more than double the old limit.

"This discovery opened the door to an entirely unexplored area for a reduction in the use of nickel," he said.

Continuing the disclosure of the results of his studies on nickel-free stainless, Dr. Carney said, "Further work is necessary to establish more carefully the corrosion, welding and high temperature properties of these high-nitrogen steels."

"It is also necessary to solve several rolling and finishing problems. It is expected, however, that these problems will be resolved in the near future. If so, the way may be opened to a further marked increase in stainless steel production and application. A new grade of austenitic stainless steel has been developed with special fields of application and not merely as a substitute for presently used grades during periods of nickel shortage."

Sound Idea

Fighting sound with sound is the newest concept in the war against noise, *Chemical Engineering* says. A new machine has been developed that determines the frequency and character of an existing sound wave, then sends out its own sound of the same frequency but of opposite phase. Interference results and the waves cancel each other, giving a localized cone of silence.

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WSE Personals

Dr. Joseph C. Boyce, associate director of Argonne National laboratory, has been named by Illinois Institute of Technology, to become its vice-president of academic affairs and dean of its graduate school, it was announced Nov. 7 by President John T. Rettaliata, MWSE.

Boyce will assume his new position on Dec. 1 and fill a vice presidency post at Illinois Tech which has been vacant since Rettaliata was promoted from it in 1952 to become the Institute's president.

* * *

Jack H. McMinn has recently opened an office under the firm name of Soil Testing Services of California, Inc. at 1798 Filbert Street, San Francisco. The firm is affiliated with Soil Testing Services, Inc. of Chicago, and will be engaged in the performance of field and laboratory investigations of soils, preparation of reports and recommendations regarding foundations, inspection of foundation construction and compacted fills, chemical modification of soils, and sale of soil testing equipment manufactured by Karol-Warner and Tinius Olsen Testing Machine Company.

* * *

V. S. Lazzara, president of Casting Engineers, Inc., Chicago, was elected president of the Investment Casting Institute, at the ICI annual meeting in Detroit, Nov. 1-3.

Also elected as vice president of the Institute was R. S. Banister, Midwest Foundry Company.

* * *

Dr. Robert C. Kintner, a chemical engineering professor at I.I.T., has been awarded a $6,700 grant from the National Science foundation in support of "bubble technology" research.

He received the grant for a continuation of his study of "Motion of Gas Bubbles and Liquid Drops in a Liquid Measure," a subject on which he has been conducting research since 1949. The $6,700 grant will finance two additional years of investigation.

* * *

Richard G. Schimpf, a specialist in automatic and semi-automatic machinery, has been named to the post of engineering manager of the ordnance research and engineering department, by Elgin National Watch Company.

The appointment was announced by George W. Fraker, general manager of the ordnance division.

* * *

Robert A. McClure's appointment as general superintendent of U. S. Steel's Gary Sheet and Tin Mill was announced recently by E. H. Gott, general manager, operations-steel. McClure succeeds John E. Angle, recently appointed vice president, industrial engineering.

I.I.T. has added five members to its Board of Trustees.

The new board members include Philip S. Beebe, western department manager, Hartford Fire Insurance Company; Eskil I. Bjork, president, Peoples Gas Company; Robert E. Brooker, vice-president, Sears, Roebuck and Company; Colin S. Gordon, executive vice-president, Quaker Oats Company; and Harold C. Mueller, president, Powers Regulator Company.

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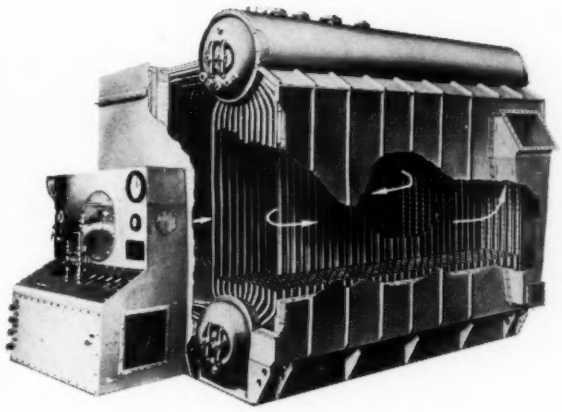

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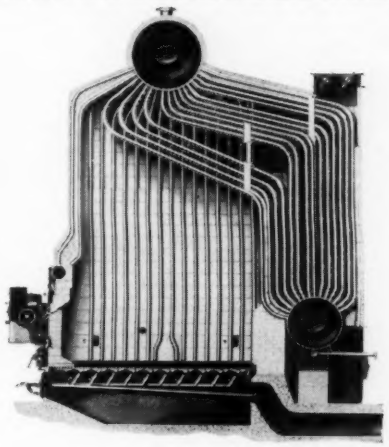

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Engineering News from Commonwealth Edison

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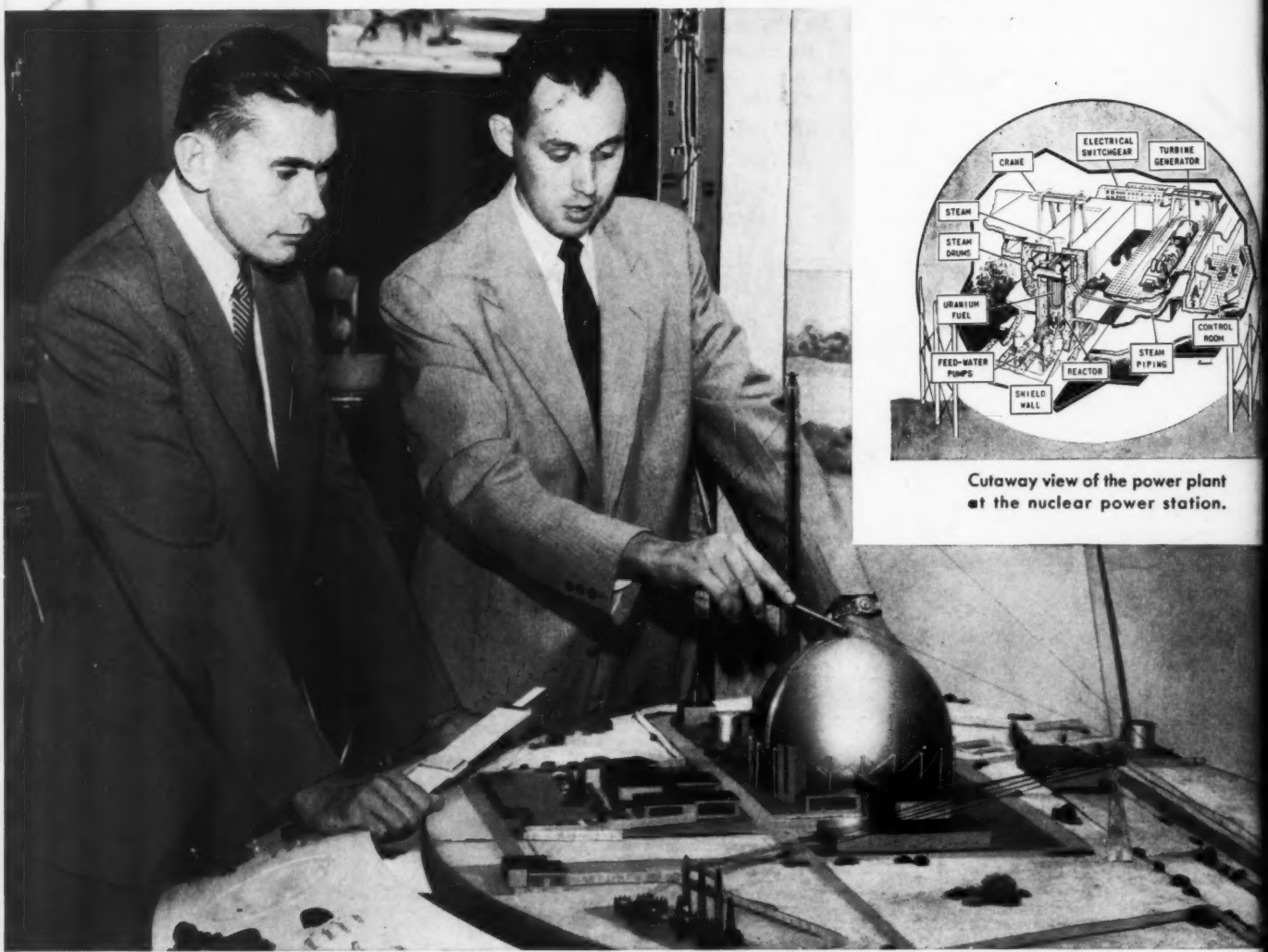

Cutaway view of the power plant at the nuclear power station.

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